WE CLAIM:

1. Apparatus comprising:

a substrate,

a micro-fluidic elongated channel formed in the substrate, said channel being in fluid-flow communication with an ambient region along its elongated dimension,

an input port for introducing a fluid into said channel and an output port for extracting fluid from said channel, said fluid comprising a high vapor pressure first substance and a low vapor pressure second substance, and

an evaporation controller, said controller being configured to increase the evaporation rate of said fluid from said channel into said ambient region, thereby increasing the concentration of said second substance in the portion of said fluid remaining in said channel and increasing the concentration of said first substance in the portion of said fluid evaporated into said ambient region.

2. The apparatus of claim 1, further including a collection chamber that includes said ambient region.

3. The apparatus of claim 2, further including means for condensing the portion of said first substance that is collected in said chamber.

4. The apparatus of claim 1, further including a gas-permeable membrane disposed between said channel and said ambient region, said membrane confining said fluid to said channel but allowing said evaporated first substance to flow therethrough to said ambient region.

5. The apparatus of claim 4, wherein said membrane comprises a polymer or a porous inorganic solid.

6. The apparatus of claim 1, wherein said evaporation controller comprises a heater coupled to said substrate for supplying heat to said the fluid in said channel.

7. The apparatus of claim 6, wherein said controller operates said heater in a

pulsed mode.

8. The apparatus of claim 1, wherein said evaporation controller comprises means for reducing the pressure of said ambient region.

9. The apparatus of claim 1, wherein said evaporation controller is configured to blow a gas across the interface between said fluid and said ambient region.

10. The apparatus of claim 1, wherein said channel has a serpentine shape.

11. The apparatus of claim 1, further including a coating formed on the surfaces of said channel.

12. Apparatus comprising

a first substrate including a serpentine first channel disposed toward one end thereof,

an input port for introducing fluid into said first channel, said fluid including a high vapor pressure first substance and a lower vapor pressure second substance,

a second substrate including a serpentine second channel disposed toward the opposite end thereof and further including a collection cavity in fluid-flow communication with said first and second channels,

a gas-permeable membrane disposed between said first and second substrates, said membrane being in fluid-flow communication with said first channel,

means for heating said fluid in said first channel to cause a portion of said fluid to evaporate and pass through said membrane into said cavity, and

means for cooling said fluid portion in said cavity to cause it to condense, said condensed fluid flowing into said second channel.

13. The apparatus of claim 12, further including a coating formed on the surfaces of said channels.

14. A method of altering the concentrations of a higher vapor pressure first substance and a lower vapor pressure second substance in a fluid, comprising the steps of:

(a) introducing the fluid into an input port of an elongated micro-fluidic channel, said channel being in fluid-flow communication with an ambient region along its elongated dimension,

(b) causing the fluid to flow along the channel and to exit from an output port, and

(c) increasing the evaporation rate of said fluid from said channel into said ambient region, thereby increasing the concentration of said second substance in the portion of said fluid remaining in said channel and increasing the concentration of said first substance in the portion of said fluid evaporated into said ambient region.

15. The method of claim 14, further including the step of collecting and condensing the portion of said fluid that evaporates into said ambient region.

16. The method of claim 14, wherein said evaporation rate increasing step includes heating the fluid in said channel.

17. The method of claim 16, wherein said heating step operates in a pulsed mode.

18. The method of claim 14, wherein said evaporation rate increasing step includes reducing the pressure of said ambient region.

19. The method of claim 14, wherein step (c) includes the step of blowing gas across the interface between said fluid and said ambient region.

20. The method of claim 14, wherein a gas-permeable membrane is disposed between said channel and said ambient region, said membrane confining said fluid to said channel but allowing said evaporated first substance to flow therethrough to said ambient region,

21. The method of claim 14, further including the step of collecting the portion of said fluid remaining in said channel.